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PAR 222

8 Sept 64

SUBJECT: Stereo Registration System

## TASK/PROBLEM

1. Investigate possible means for automatically maintaining proper registration for stereo viewing on rear projection and direct roll film viewers.

## DISCUSSION

2. Prior to this quarter, investigation studies and tests were made of various components to verify breadboard design parameters and to insure the feasibility of the over-all design concept. Breadboard fabrication had progressed to an approximate 80 percent completion point.

3. Effort during the subject report period consisted mainly of breadboard completion and testing.

4. The breadboard equipment consists of an electrical stereo registration console (Figure 1) and a stereo registration optical system (Figure 2).

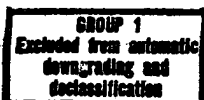
a. Electrical

(1) The logic and associated power supplies were assembled into a rack cabinet for ease of transportation and hook-up. A meter panel indicates the registration error X, Y,  $\theta$  and M.

(2) A sweep circuit for the CRT is mounted on one of the logic plug boards. The circuit consists of two push-pull emitter followers, one for each yoke coil.

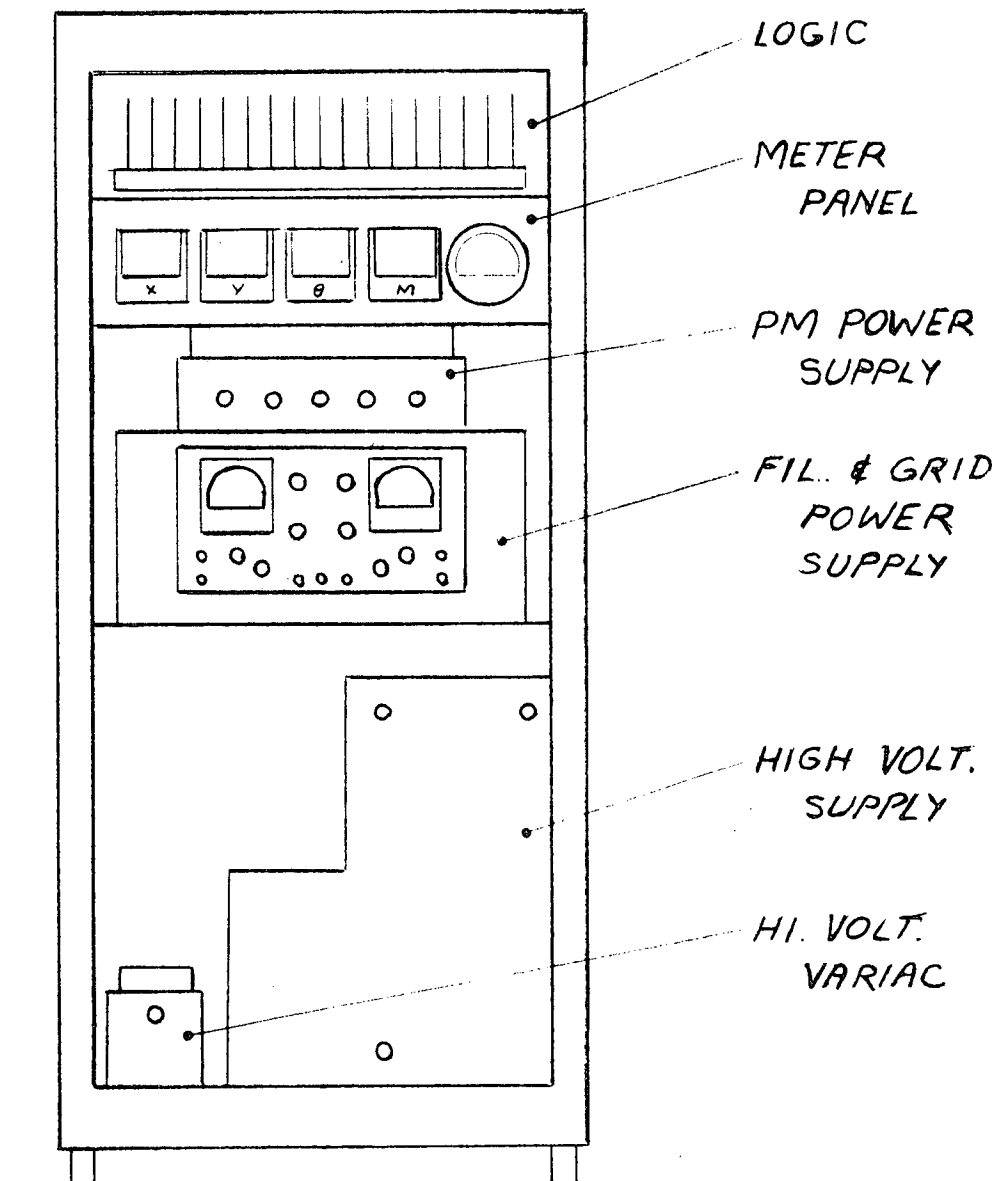
(3) Photomultiplier (PM) tubes convert the outputs of the two optical scanning signals to electrical signals for meter display.

(4) For operator viewing, two light sources (with yellow filters) are projected through the matched stereo transparencies, in the reverse direction

**SECRET**

**SECRET**

PAR 222  
8 SEPT. 64



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STEREO REGISTRATION  
CONSOLE

FIGURE 1

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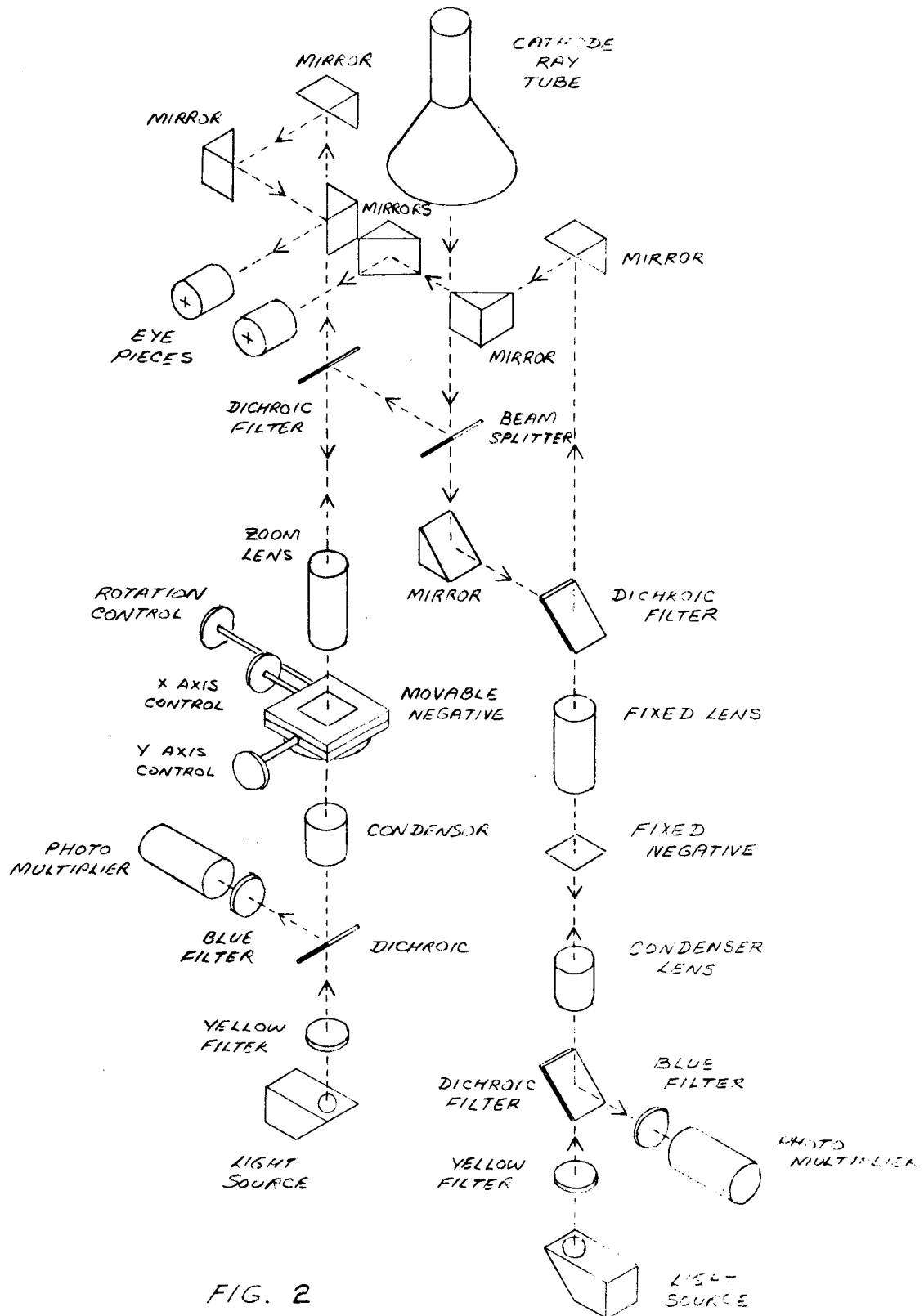


FIG. 2  
STEREO REGISTRATION  
OPTICAL SYSTEM

**SECRET**

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**SECRET**

PAR 222

8 Sept 64

of the scanning beam, and present the transparency images to binocular viewing eyepieces.

(5) The matched stereo transparencies are held between glass plates. One transparency is held in a fixed position, the other is mounted in a Leitz mechanical stage with micrometer adjustments graduated in and capable of 0.0001 inch X, Y linear motion and one minute rotational motion.

(6) Portrait attachments in front of the Zoom lenses are required to place the object (trace) at its proper lens design conjugate.

5. Testing: Using cross patterns, dupe negatives and stereo pairs, tests were conducted on the breadboard equipment in which X-Y,  $\theta$  and M errors were displayed on four meters (microammeters).

a. Optical Alignment: Using a collimator, surface perpendicularity and axes alignment between the face of the CRT, the transparency planes and both PM tubes were established.

b. Image Alignment: After matched dupe negative or stereo pairs transparencies had been optically aligned, the position of the free transparency was:

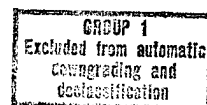
- (1) Moved linearly a known amount along the X and/or Y axis.
- (2) Rotated a known amount.
- (3) Repositioned in regard to magnification.

c. Meter Displays: The error readings displayed on the four meters were analyzed to determine the ability of the equipment to recognize axial (X and Y), rotational ( $\theta$ ), and magnification (M) errors in both degree and amount.

6. System Effectiveness: Based on the results of breadboard testing, stereo or image registration through electronic scanning appears promising. The existing breadboard is useful for illustrating system feasibility when selected targets are used. However, when random targets are selected, the output error signals may lack the coherence necessary to cause intelligent correction.

**SECRET**

-34-



**SECRET**

PAR 222

8 Sept 64

7. Output error signals, using selected targets and displayed on meters in the subject breadboard testing, can be connected, by feedback loops to drive servo motors and mechanically maintain registration.

8. Before a complete practical system can be designed and fabricated, it is recommended that:

- a. Refined circuitry be designed and tested.
- b. Based on the results of (a) above, a more sophisticated breadboard be designed and built.
- c. Comprehensive testing of a representative sample of random stereo image pair and matched dupe negative targets be tested using the new breadboard.

9. The final report, Stereo Registration System, is being prepared and will be published in November 1964. The final report will cover in detail:

- a. Theory.
- b. Breadboard configuration.
- c. Testing and test results.
- d. Evaluation.
- e. Problems and limitations.
- f. Recommendations.
- g. Conclusions.

#### PLANNED ACTIVITIES

10. The final report will be completed and published in November 1964.

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